

polymer consists essentially of "a hydrolysis and condensation polymerization product of an organosilane..." These claims thus exclude from the siloxane polymer any additional components which would affect the material properties of the polymer. Support for these amendments may be found in the specification at least at page 3, line 15 and in the Examples, in which siloxane polymers are formed from only organosilanes and water. No new matter has been added by these amendments.

In Paper No. 15, the Examiner has rejected claims 1, 8, 11, 12, 14, 16-18 and 23 under 35 U.S.C. § 102(b) as anticipated by, or, in the alternative, under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 4,923,775 of Schank ("Schank"). Claims 2, 5, 13 and 15 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Schank. Finally, the Examiner has rejected claims 1, 9, 11-13 and 15-19 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 3,666,830 of Alekna ("Alekna"). Applicants respectfully traverse these rejections and the arguments in support thereof for the reasons set forth in the Amendments filed September 10, 2001 and February 25, 2002, which Applicants rely upon in full, and for the additional reasons set forth below. Reconsideration and withdrawal of the rejections are respectfully requested.

Rejections Under §§ 102(b) and 103(a) Based on Schank

Regarding Schank, the Examiner argues that the siloxane polymer allegedly taught by Schank is prepared by the hydrolysis and condensation of a silane having an electronegative substituent in the  $\beta$ -position, and that since the compounds taught by Schank and the claimed compounds are identical, the chemical properties would inherently be the same. As a result, even though the Examiner acknowledges that Schank does not teach thermal lability of

the polymers or the release of alkyl groups, she maintains that these properties are allegedly inherently associated with the product, and that the Schank compounds will inherently degrade at high enough temperatures. Applicants respectfully traverse this rejection as follows.

In col. 6, lines 11-41, Schank teaches a long list of compounds containing two, three, or four electron withdrawing groups. However, Schank does not teach that the substituent must contain an electronegative group in the position  $\beta$  to silicon as claimed. In fact, some of the compounds taught by Schank do not contain such a substituent, such as the chloromethyl group taught in col. 6, line 32. It is critical for the present invention that the organosilane contain an alkyl group having an electronegative  $\beta$  substituent so that the resulting siloxane polymer can eliminate the  $\beta$  substituted group to yield  $\text{SiO}_2$ -rich films, which elimination occurs at low temperatures. In fact, as demonstrated in the Comparative Example at pages 26-27 of the present application, a siloxane prepared from a 2-chloromethyl-substituted organosilane, as taught by Schank, lacks a  $\beta$ -substituted alkyl group and is inferior to the claimed compounds. Specifically, unlike the siloxane reaction products according to the present invention, thermal treatment of the chloromethylsilsesquioxane reaction product did not result in crosslinking and elimination of a labile olefin. Rather, conversion of the 2-chloromethyl substituted siloxane to a  $\text{SiO}_2$ -containing coating required high temperatures, in excess of  $450^\circ\text{C}$ , which would not be acceptable for many microelectronic processing applications.

Schank teaches elastomers which do not degrade at elevated temperatures. Indeed, the 2-chloromethyl derivative taught by Schank, and used to prepare a siloxane in the Comparative Example, required temperatures in excess of  $450^\circ\text{C}$  in order to degrade. Accordingly, Schank not only teaches away from the claimed compounds, which need only moderate temperatures to eliminate and produce the desired siloxane polymers, but also does not

recognize the criticality of substitution at the position  $\beta$  to silicon. Applicants have discovered that the presence of an electronegative substituent in the  $\beta$  position is critical for imbuing the organosilane with the needed thermal lability to produce a siloxane at temperatures which are appropriate for microelectronic applications. Shown in the Examples in the present specification are siloxane polymers which were prepared using 2-chloroethyl-, 2-bromoethyl-, 1,2-dichloroethyl-,  $\beta$ -acetoxyethyl-, and  $\beta$ -hydroxyethyl-substituted organosilanes. These polymers, which contain a functional group in the  $\beta$  position, indeed eliminate at moderate temperatures (> 150°C).

Finally, although some of Applicants' claimed compounds overlap the broad range of compounds encompassed by Schank, Schank merely teaches a long list of possible electron-withdrawing groups which may be the substituents on a silanol, compounds which are stable at high temperatures. Schank does not teach the benefits of  $\beta$  substitution. Therefore, Applicants' invention may be regarded as a selection invention, in which, through experimentation, Applicants have discovered the specific structures necessary to produce SiO<sub>2</sub>-rich films which are appropriate for microelectronic applications.

Accordingly, reconsideration and withdrawal of the rejections based on Schank are respectfully requested.

Rejection Under §103(a) Based on Alekna

Regarding Alekna, the Examiner argues that since the  $\beta$ -chloroethyl siloxanes embraced by the claims are the same as those suggested by Alekna, they will inherently have the same properties. The Examiner maintains that while Alekna teaches that the resin can be

refluxed between 190 and 230°C, this does not mean that the polymers are not thermally labile at higher temperatures.

In contrast with the presently claimed siloxanes, which are prepared from the hydrolysis and condensation of organosilanes, Alekna describes two-component resin molding compounds in which the first component is an uncured silicone resin (containing at least 0.25% of silicon-bonded hydroxyl groups or lower alkoxy groups) and the second component is (i) a silane or siloxane containing silanol groups or alkoxy groups and (ii) a lead-based catalyst (column 1, lines 39-70). Alekna's two-component molding resins in no manner suggest Applicants' siloxane polymer for two reasons. First, there is nothing in Alekna to teach or suggest that the resins are thermally labile at any temperature to eliminate β-substituted alkyl groups as claimed. Rather, it is possible that the compounds of Alekna would degrade at elevated temperatures. Further, the compounds of Alekna are clearly not thermally labile at 150 °C since they can be refluxed at 190 to 230 °C. Additionally, the resins of Alekna require the presence of a lead catalyst, in contrast with Applicants' siloxane polymers.

Furthermore, new claims 24 and 25 recite that the siloxane polymer consists essentially of a hydrolysis and condensation polymerization product of an organosilane. This "consisting essentially of" language excludes the presence of additional components in the polymer which would materially affect its properties. For example, in the materials of Alekna, which are prepared using a lead catalyst, residual amounts of catalyst would remain in the polymer. Such catalyst residues would be undesirable in microelectronic applications, in which purity is essential. Because Alekna does not teach resins consisting essentially of organosilane

reaction products, Alekna does not teach all of the elements of new claims 24 and 25.

Reconsideration and withdrawal of the rejection based on Alekna are respectfully requested.

In view of the preceding Amendments, Applicants respectfully submit that the pending claims are patentably distinct from the prior art of record and in condition for allowance. A Notice of Allowance is respectfully requested.

Respectfully submitted,

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(Date)

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